# Human Factors Model

**A SPINOFF SOFTWARE TOOL IS FINDING WIDE UTILITY AMONG INDUSTRIAL DESIGNERS**

**S**hown below is Jack™, an advanced human factors software package available commercially for a broad range of computer-aided design applications. The product of more than a decade's research, Jack was developed by the Computer Graphics Research Laboratory of the University of Pennsylvania, with assistance by NASA and other government research agencies.

Jack is a visualization tool that provides a three dimensional model for predicting how a human will interact with a given system or environment, such as the helicopter cockpit design pictured. In this application, Jack helps a designer determine whether a human pilot would fit comfortably in the cockpit space provided, whether he would have an adequate field of vision, whether he could reach the controls, etc. Jack offers a number of unique features that can be useful not only to commercial and industrial equipment manufacturers but to architects and interior designers as well.

This marks the first time the University of Pennsylvania has directly marketed technology from any of its R&D projects. The program has already been used extensively in development and evaluation of Space Station *Freedom*, an Army helicopter and other military vehicles, and it played an important role in the human factors design of a new line of earthmoving equipment developed by Deere & Company. "With Jack," say its developers, "important ergonomic decisions are made at the workstation and considerable cost savings are realized over building and testing expensive prototypes."

The computer model's body consists of 39 segments, 38 joints and 88 degrees of freedom, including a 17-segment flexible torso. All parts are programmed to move automatically in response to commands, and a window on the screen shows the view as Jack sees it. Designers may configure as many models as necessary in an almost unlimited range of body proportions and abilities.

Johnson Space Center (JSC) was the original investor in the Jack development effort and JSC gave Jack its first real-world problems to solve. JSC functions as a co-researcher toward advancing computer modeling science, and the center provides data to the University of Pennsylvania for use in later versions of Jack.

Other supporters of the program include the Army Research Office and the Army Human Engineering Laboratory. Another contributor is Ames Research Center, which has incorporated Jack into a human factors system known as MIDAS (Man-machine Integrated Design and Analysis). ●

™ Jack is a trademark of the University of Pennsylvania.